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(71) Applicant
Seaboard Plc

(Incorporated in the United Kingdom)

Grand Avenue, Hove, East Sussex, BN3 2LS,
United Kingdom

(72) Inventor
David Charles Miller

(74) Agent and/or Address for Service
Boulton Wade & Tennant
27 Fumival Street, London, EC4A 1PQ,
United Kingdom

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(54) Device and method for remotely lowering a load suspended by ropes

(57) A device and method is described for remotely lowering a load using ropes. The load can be an incapacitated climber 11. A first rope 1 is hung over a fixed point such as a branch 2 and one end 4 is tied to the load by for instance the harness 3. A second rope 6 is attached at one end to the load and at the other end using a slip knot 9 such as a prussik knot to the first rope 1. The knot 9 tightens to grip the first rope 1 under the weight of the load 11. A sleeve 12 with attached lowering rope 13 allows for a remote operator to apply pressure to the knot 9 and lower the load 11.

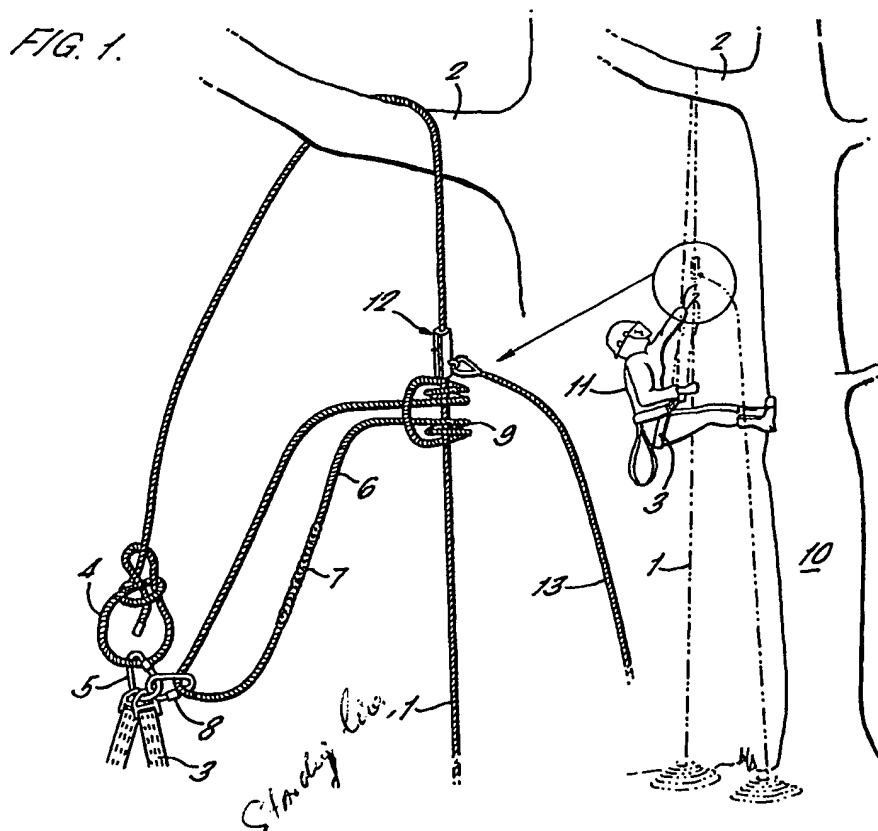
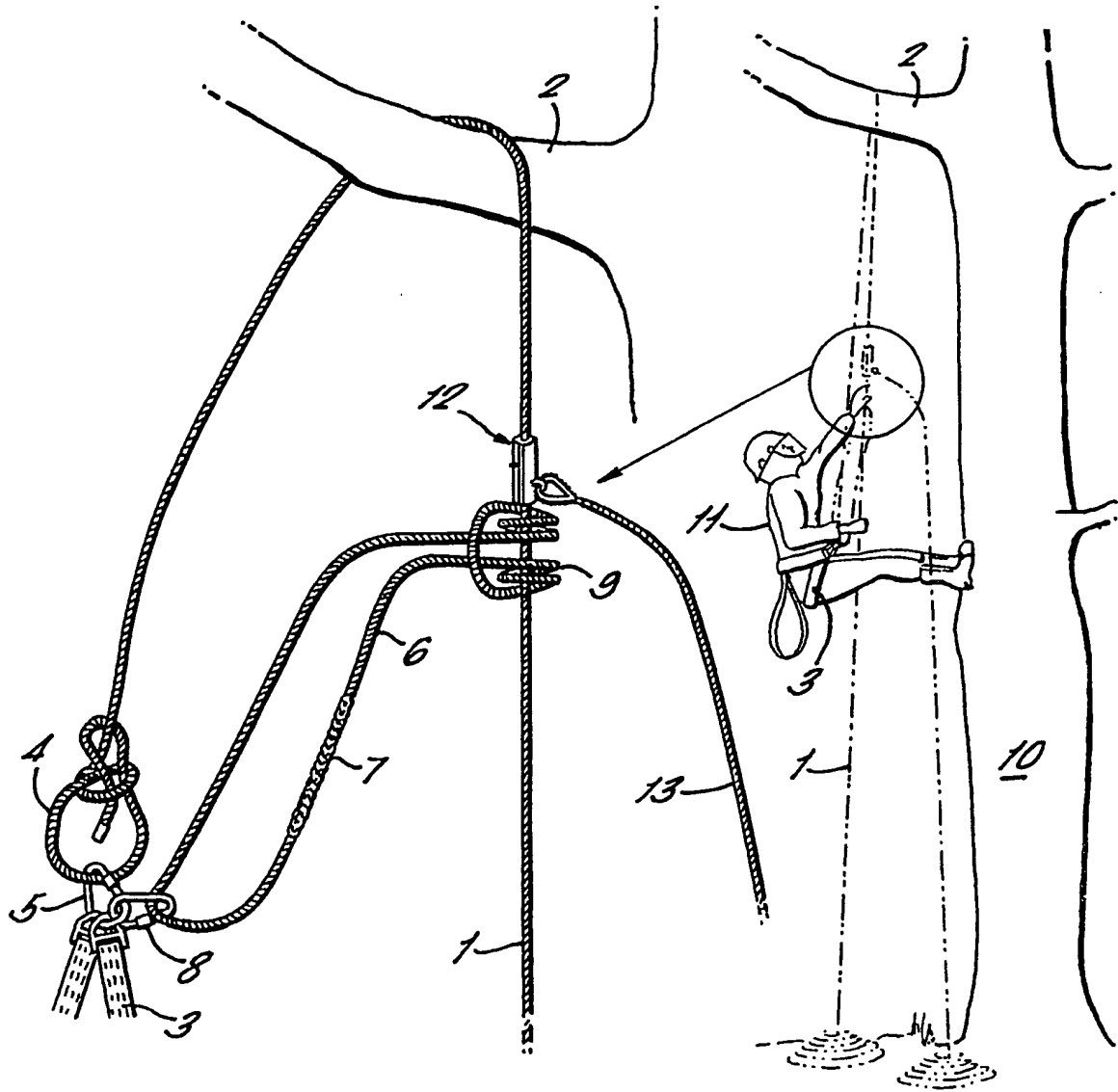
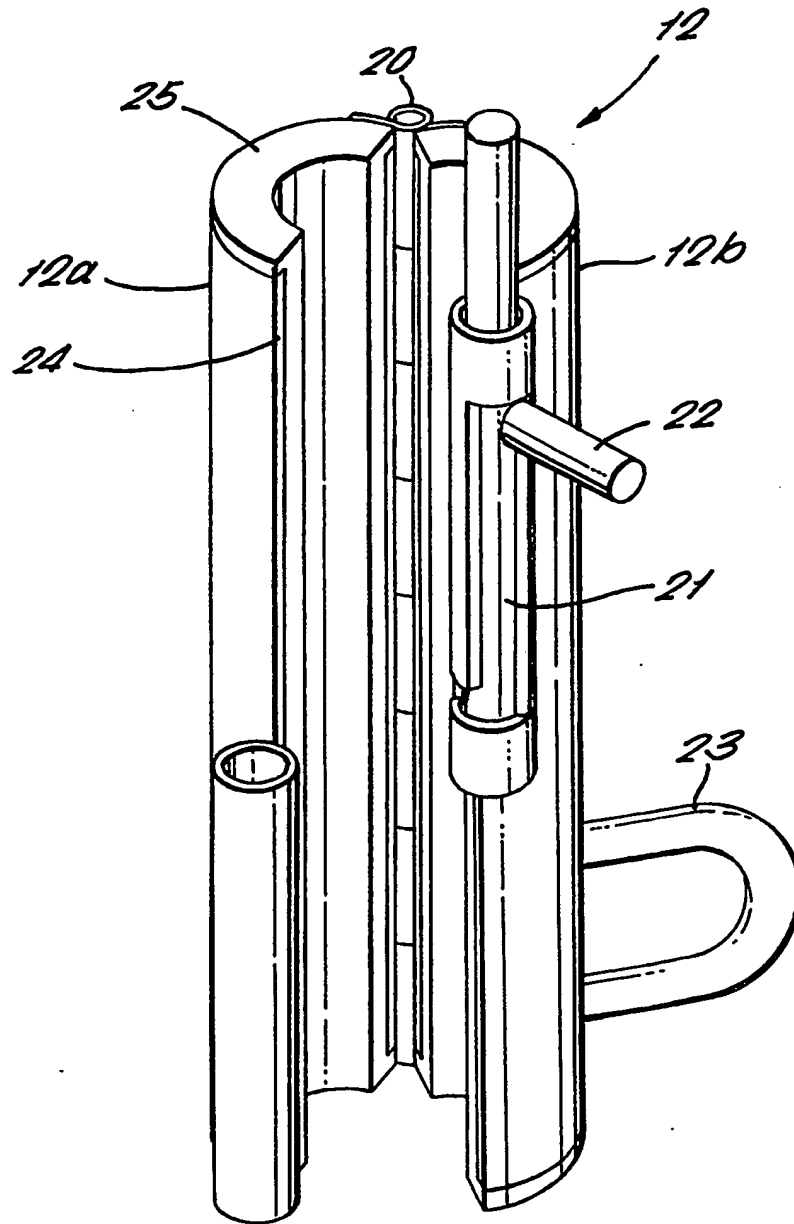


FIG. 1.



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FIG. 2.



DEVICE AND METHOD FOR REMOTELY LOWERING
A LOAD SUSPENDED BY ROPES

This invention generally relates to a method and device for remotely lowering a load suspended by ropes, and in particular to the application of such a device and method to rescuing an incapacitated climber.

It is a requirement that when loads are lowered by ropes, then this should be done as safely as possible. The provision of some means that locks the load in position when the ropes are released is highly desirable to prevent the load rapidly descending and causing injury.

There is also a known problem for climbers that when the climber becomes incapacitated for some reason, it is not possible for rescuers to lower the incapacitated climber without having to climb up to reach him.

The present invention provides a device for remotely lowering a load suspended by a first rope hung over a lowering point, said first rope being attached to said load at one end thereof, and a second rope attached to said load and to said first rope, said first and second ropes forming a loop around said lowering point and said second rope being attached to said first rope by a slip knot which tightens to grip said first rope under the weight of said load; said device comprising engagement means to engage an upper portion of said slip knot from a remote position and to apply a downward pressure to controllably release said grip.

The present invention also provides a method for remotely lowering a load comprising the steps of hanging a first rope over a lowering point and attaching one end

thereof to said load; attaching a second rope to said load and said first rope such that said first and second ropes form a loop around said lowering point, and said second rope grips said first rope by the action of a slip knot which tightens under the weight of said load; and remotely applying a downward pressure on an upper portion of said slip knot to controllably release said grip.

The present invention further provides a method for remotely lowering a load suspended by a first rope hung over a lowering point, said first rope being attached to said load one end thereof, and a second rope attached to said load and to said first rope, said first and second ropes forming a loop around said lowering point and said second rope being attached to said first rope by a slip knot which tightens to grip said first rope under the weight of said load; said method comprising the step of applying a downward pressure to an upper portion of said slip knot to controllably release said grip.

In one aspect of the present invention said load is an incapacitated climber.

The present invention also provides climbing apparatus comprising a first rope to be hung over an object to be climbed and attached to a climber at one end thereof; a second rope for attachment to said climber and said first rope, such that said first and second ropes form a loop around said object and said second rope grips said first rope by the action of a slip knot which tightens under the weight of said climber; and a rescue device for lowering an incapacitated climber comprising means to engage an upper portion of said slip knot from a remote position and to apply a downward pressure to controllably release said grip.

Preferably said engagement means comprises a loop portion for looping around said first rope to engage with

said upper portion of said slip knot and a lowering rope attached to said loop portion, wherein said downward pressure can be applied by an operator or rescuer using said lowering rope.

Preferably said loop portion comprises a sleeve and comprises two parts for engagement around said first rope. In a preferred arrangement said two parts are longitudinally hinged at one side with longitudinal lock means at an opposite side.

Thus the present invention provides a device and method for remotely applying pressure to a knot which is holding a load such as an incapacitated climber in a suspended position. The engagement means applying a downward pressure on the knot overcomes friction which maintains the load in its equilibrium position. When the applied downward pressure is released, friction once again allows the knot to grip the rope and the descent of the load will stop. Clearly therefore the careful application of pressure on the knot can control the rate of descent of the load. Thus a person standing in a remote position such as on the ground can use for instance a rope to apply the downward pressure and thus control the descent of the load.

Examples of the present invention will now be described with reference to the drawings, in which:-

Figure 1 illustrates the rope arrangement applied to lowering an incapacitated climber according to one embodiment of the invention;

Figure 2 illustrates a sleeve used to apply a downward pressure on the slip knot according to one embodiment of the present invention;

Referring now to the drawings, Figure 1 illustrates a rope arrangement illustrated as used for climbing a tree 10 by a climber 11. A first rope 1 is hung over a fixed

point of an object which in this example is the branch 2 of the tree 10. One end 4 of the rope is tied using a convenient knot such as a bowline to a karabiner 5 attached to the harness 3 of the climber 11. A second rope 6 is provided as a loop formed by two ends of the rope 6 being spliced together at splice 7. One end of the looped second rope 6 is attached to a second karabiner 8 which is attached to the harness 3 of the climber 11, and the other end of the looped second rope 6 forms a slip knot 9 around the first rope 1. Typically the slip knot 9 is a prussik knot. This type of knot grips the first rope 1 when the second rope 6 has a load applied thereto. Thus when a climber is suspended in the harness 3, the loop of rope formed by the first and second ropes suspend the climber. The climber can climb up the tree 10 by releasing some of the pressure on the second rope 6 enabling the prussik knot 9 to be slid up the first rope 1. This can be done by using one hand to pull on the first rope 1 whilst sliding the prussik knot 9 up with the other hand. To descend, the climber can simply apply a pressure to the upper portion of the prussik knot 9 to release the grip of this knot on the first rope. In this manner a climber is able to ascend and descend an object to be climbed such as a tree 10 in a simple and safe manner.

However, if the climber should become in any way incapacitated and unable to apply the required downward pressure on the prussik knot 9, then the climber will remain suspended. Thus previously it has not been possible to rescue such an incapacitated climber without ascending in some manner.

In the illustrated embodiment of the present invention a sleeve 12 is provided around the first rope 1 at a position above the prussik knot 9. This sleeve 12 is

free to slide along the first rope 1. Attached to the sleeve 12 is a lowering rope 13 which hangs to the ground. During normal operation of the climbing ropes the sleeve 12 and lowering rope 13 are not utilised. Only if the climber 11 becomes incapacitated in some way then these are used. If a climber is incapacitated by for instance an electric shock then a potential rescuer can pull on the lowering rope 13 to apply a downward pressure on the prussik knot 9 to overcome friction between the first and second ropes 1 and 6. By careful application of pressure on the prussik knot 9, a potential rescuer can control the rate of descent of the incapacitated climber.

Although the example described hereinabove has been concerned with lowering an incapacitated climber, the arrangement shown in Figure 1 can be used for lowering any load to ground. All that is needed is for the first and second ropes 1 and 6 to be arranged in the shown configuration and the load to be hung from the harness 3 or some other suitable means. This would then allow an operator to utilise the lowering rope 13 to control the rate of descent of the load. If for any reason the operator should let go of the rope, then the prussik knot 9 will regrip the first rope 1 and the load will descend no further. Clearly this is a safer arrangement for lowering a load than used conventionally, since in previous arrangements if an operator releases the rope which he is using to lower the load, then the load will descend freely under the action of gravity in a dangerous manner.

There are many ways in which the required pressure could be applied to an upper portion of the prussik knot 9. In a simple arrangement a loop could be provided at the end of the rope 13 through which the first rope 1 is threaded. However, this does not allow the lowering rope 13 to be easily detached from the first rope 1. In this

arrangement it would require the whole length of the first rope 1 to be unthreaded through such a loop. To allow easy engagement and disengagement of a means to apply the required downward pressure, a sleeve 12 is preferably formed of two halves longitudinally separated. Figure 2 illustrates such a sleeve which has a longitudinal hinge 20 allowing a first and second portion 12a and 12b of the sleeve to be hingely engaged around the first rope 1. The sleeve 12 is also provided with a longitudinal lock means comprising a longitudinally engageable bolt 21 which can be actuated by the bolt handle 22. The bolt 21 is provided on the opposite side of the sleeve 12 to the longitudinal hinge 20 and allows for the sleeve 12 to be locked in an engaging position around the first rope 1. The sleeve 12 is also provided with a hoop 23 for the lowering rope 13 to be attached to. The sleeve 12 can be made out of any convenient materials exhibiting the required mechanical properties. In this embodiment an outer sleeve 24 of stainless steel is provided having a nylon bush 25. Thus the sleeve shown in Figure 2 can conveniently be clamped around the first rope 1 whenever required. This is particularly convenient when a climb is performed in more than one stage as will be discussed hereinafter.

In a two or more stage climb the climber 2 will ascend to a first position such as branch 2. Upon reaching that position he will secure himself and then pass the second end of the first rope (i.e. the end not already attached to the harness 3) over a further branch and secure that end to the harness. Then a second prussik knot will be attached to the first rope 1 and to a further karabiner attached to the climber's harness. Once the climber is satisfied that the rope is secure, the sleeve 12 is released from its lower position around the first rope 1 to a new position above the second prussik knot. The first

prussik knot can then be undone and the first end 4 of the first rope 1 undone and allowed to fall as far as practical in a vertical route to ground. The climber is thus then able to climb in the same manner as for the first stage, with the sleeve being maintained in a position capable of lowering the climber in case of an accident.

Although the example described hereinabove has been directed principally towards a climbing arrangement, the rope arrangement in Figure 1 is clearly applicable to lowering any load from a fixed lowering point by using engagement means to engage an upper portion of the prussik knot 9 from a remote position such as the ground.

CLAIMS

1. A device for remotely lowering a load suspended by a first rope hung over a lowering point, said first rope being attached to said load at one end thereof, and a second rope attached to said load and to said first rope, said first and second ropes forming a loop around said lowering point and said second rope being attached to said first rope by a slip knot which tightens to grip said first rope under the weight of said load; said device comprising engagement means to engage an upper portion of said slip knot from a remote position and to apply a downward pressure to controllably release said grip.
2. A device as claimed in Claim 1, wherein said engagement means comprises a loop portion for looping around said first rope, to engage with said upper portion of said slip knot and a lowering rope attached to said loop portion, wherein said downward pressure can be applied by an operator using said lowering rope.
3. A device as claimed in Claim 2, wherein said loop portion comprises a sleeve.
4. A device as claimed in Claim 3, wherein said sleeve comprises two parts for engagement around said first rope.
5. A device as claimed in Claim 4, wherein said two parts are longitudinally hinged at one side with longitudinal lock means at an opposite side.
6. A method for safely and remotely lowering a load, comprising the steps of hanging a first rope over a fixed

lowering point and attaching one end thereof to said load; attaching a second rope to said load and said first rope such that said first and second ropes form a loop around said lowering point, and said second rope grips said first rope by the action of a slip knot which tightens under the weight of said load; and remotely applying a downward pressure on an upper portion of said slip knot to controllably release said grip.

7. A method as claimed in Claim 6, wherein said downward pressure is applied using a lowering rope with a loop portion looped around said first rope at a position above said slip knot.

8. A method for remotely lowering a load suspended by a first rope hung over a lowering point, said first rope being attached to said load at one end thereof, and a second rope attached to said load and to said first rope, said first and second ropes forming a loop around said lowering point and said second rope being attached to said first rope by a slip knot which tightens to grip said first rope under the weight of said load; said method comprising the step of applying a downward pressure to an upper portion of said slip knot to controllably release said grip.

9. A method as claimed in Claim 8, wherein said downward pressure is applied using a lowering rope with a loop portion looped around said first rope at a position above said slip knot.

10. A method as claimed in Claims 8 or 9, wherein said load is an incapacitated climber.

11. Climbing apparatus comprising a first rope to be hung over an object to be climbed and attached to a climber at one end thereof; a second rope for attachment to said climber and said first rope, such that said first and second ropes form a loop around said object and said second rope grips said first rope by the action of a slip knot which tightens under the weight of said climber; and a rescue device for lowering an incapacitated climber comprising means to engage an upper portion of said slip knot from a remote position and to apply a downward pressure to controllably release said grip.

12. Climbing apparatus as claimed in Claim 11, wherein said engagement means comprises a loop portion for looping around said first rope, to engage with said upper portion of said slip knot and a lowering rope attached to said loop portion, wherein said downward pressure can be applied by a rescuer using said lowering rope.

13. Climbing apparatus as claimed in Claim 12, wherein said loop portion comprises a sleeve.

14. Climbing apparatus as claimed in Claim 13, wherein said sleeve comprises two parts for engagement around said first rope.

15. Climbing apparatus as claimed in Claim 14, wherein said two parts are longitudinally hinged at one side with longitudinal lock means at an opposite side.

16. Climbing apparatus as hereinbefore described with reference to any of the drawings.

17. A device for remotely lowering a load as hereinbefore described with reference to the drawings.

Patents Act 1977
Examiner's report to the Comptroller under
Section 17 (The Search Report)

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Relevant Technical fields

(i) UK Cl (Edition K) A5A ; F2X

(ii) Int Cl (Edition 5) A62B; A63B, B66D, F16G

Databases (see over)

(i) UK Patent Office

(ii)

Search Examiner

C J LUCK

Date of Search

6 JANUARY 1992

Documents considered relevant following a search in respect of claims 1-17

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
	NONE	

SF2(p)

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Category	Identity of document and relevant passages	Relevant to claim(s).

Categories of documents

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